

How to protect a

# secondary school

against the effects of lightning?



## Customer needs

This secondary school has several buildings including:

- 2 "day school" and "boarding school" 2-storey buildings with lift
- 1 gymnasium: dressing rooms and sports field
- 1 half-board building: restaurant and kitchen
- 1 technical workshop and gas boiler room
- 1 administrative building and housing for employees.

This site must comply with the regulations for protection against fire,

it has a **safety system** and **fire alarm** like all school establishments or holiday camps which have **sleeping areas**.

It is recommended to monitor the continuity of supply of **automatic detection** devices and **fire alarms** for all circumstances including atmospheric voltage surges.

## Environment

- Located in the suburbs of a large city, this establishment may be subjected to atmospheric voltage surges from near or far lightning strokes (high trees around)
- The local lightning density is moderate ( $0.5 < N_g < 1.6$ )
- It has a TN-S earthing system
- The equipment to be protected is moderately expensive, however the establishment does not have a large budget to cover for risks (and thus replacement), **sensitive devices** must therefore be well-protected: **electron microscopes, measurement devices, electronic and computer equipment**
- A great number of teaching devices and equipment have a reduced impulse withstand voltage ( $U_{choc} \leq 1.5 \text{ kV}$ ) in particular for lab workshops: **biology, chemistry, electronics and computer rooms** require suitable protection against lightning as near as possible to loads.

The same is true for **alarm and fire detection devices**.

The building, traditional construction, does not have any special earthing device, however is in compliance with the standards in force.

- The secondary school is supplied by a low voltage three-phase + neutral underground line that is supplied by the local utility.

The other supply networks: gas, telecommunications and water are underground as well.



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## Proposed solution

**The main LV distribution board MSB1** installed in the technical room in the day school building, has a Type 1+2 surge protection device for the protection against lightning (LV withdrawable surge arrester iPRF1 12.5r associated with a 100 A disconnection circuit-breaker).

**The main LV distribution cabinet MSB2** installed in the technical room for external premises, has a Type 2 device for the protection against lightning (LV withdrawal surge arrester iPRD40 associated with a 40 A disconnection circuit-breaker).

**Secondary distribution enclosures** on each floor of the other buildings are protected by 8 kA LV surge arresters (surge arrester iPRD8 associated with a 10 A disconnection circuit-breaker).

**Telecommunication, monitoring and fire alarm** devices are protected by communication surge arresters of the type:

- iPRC, for analogue telephone networks,
- iPRI 12/48 V for digital telephone and PLC networks.

## Customer benefits

- **Incoming surge arresters:** run lightning current off to the ground and limit voltage surges on equipment located in the vicinity (within a distance of 10 m max.),
- **Secondary surge arresters:** located near sensitive loads reduce the voltage between P-E and N-E so that the rated impulse withstand voltage remains lower than 1500 V,
- **In compliance with regulations.**

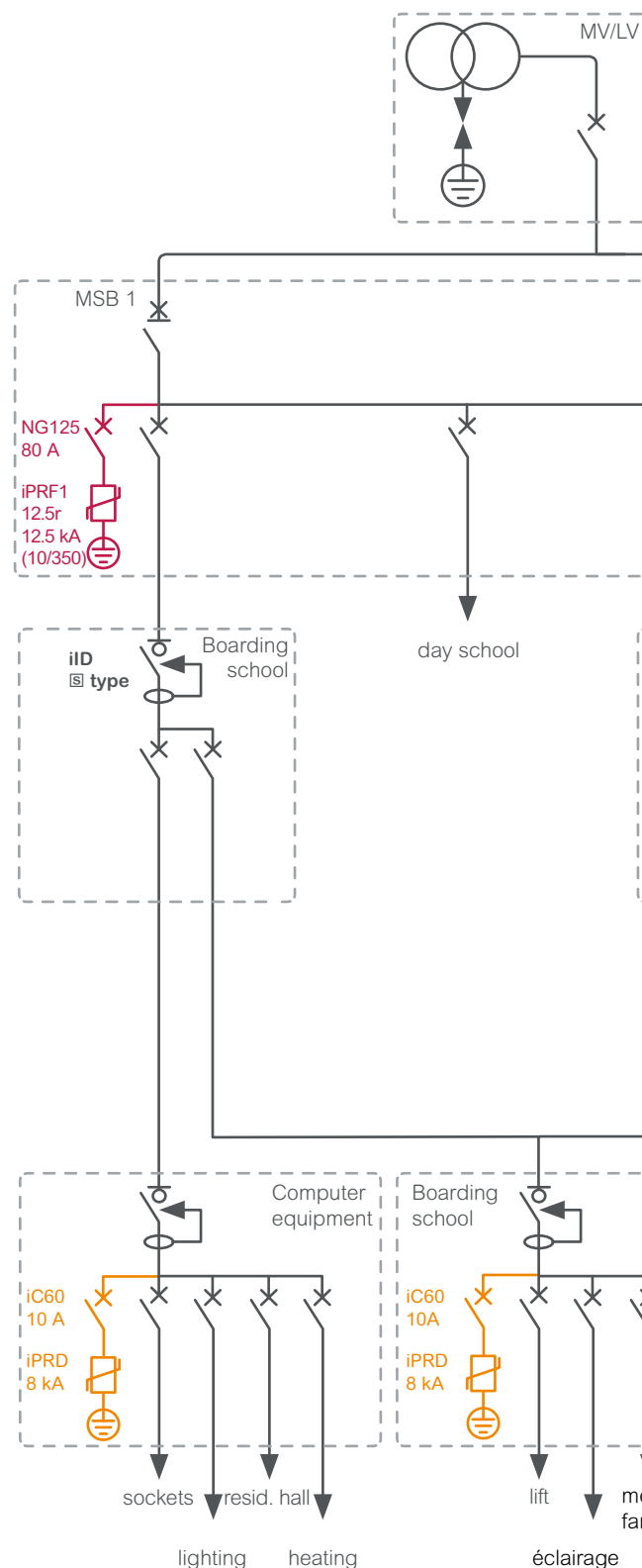
## Recommendations

- Make sure that building frames and earths are equipotentially bonded,
- Reduce loop surfaces.
- Make sure that surge arrester incoming cables are at a distance from the installations outgoing cables,
- Always associate a disconnection circuit-breaker with the surge arrester,
- If the building is fitted out with a lightning conductor, both MSB1 and MSB2 should have Type 1+2 surge arrester PRD1 25r with a high run off capacity ( $I_{imp} = 25 \text{ kA}$ ;  $I_{max} = 40 \text{ kA}$ ) with associated disconnecter Compact NSX 100B, 100 A.

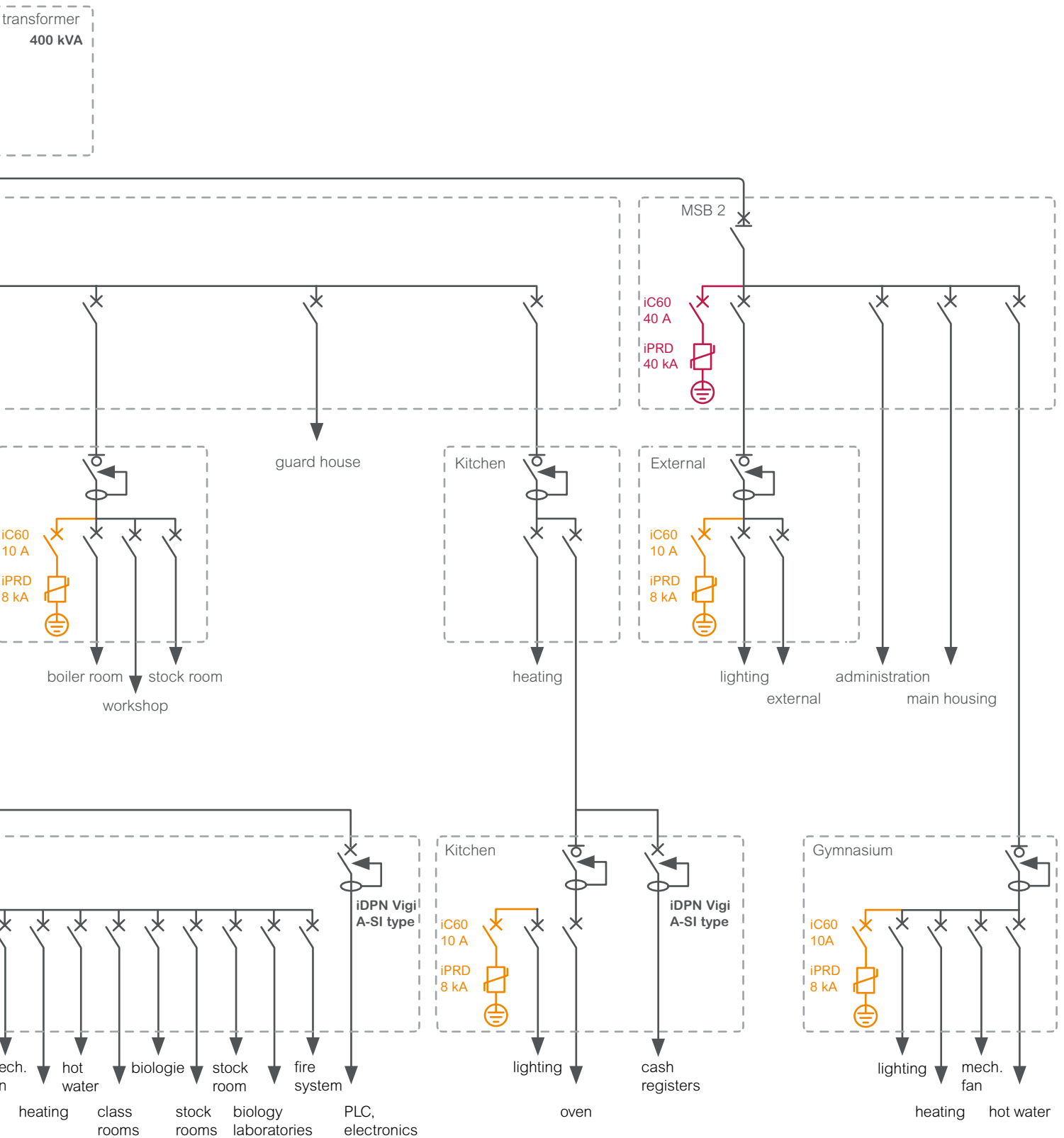
## The role of the surge arrester disconnecter

- Isolate the surge arrester from the rest of the installation in case the surge arrester's run off capacity  $I_{max}$  is exceeded, following a particularly intense lightning stroke. If the disconnecter has been activated, loads are no longer protected against atmospheric voltage surges. Replacement of the surge arrester is thus recommended.

## Solution diagram



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## Standards

- International installation standard IEC 60364-4-443 and 5-443 (09/2015)
- Electrical installation of buildings NF C 15 100 of 2002
- SPD are mandatory:
  - in case of overheadlines and if lightning density is  $N_g \geq 2.5$
  - in case of presence of lightning rod (risk of direct impact).

## Products used

Product	Description	Unity	Cat. no.
iPRF1 12.5	Type 1+2 surge protection device 12.5kA	1	-
NG125N	Miniature circuit breaker 80 A	1	-
iPRD40	Type 2 surge protection device 40 kA	1	-
iPRD8	Type 3 surge protection device 8 kA	6	-
iC60N	Miniature circuit breaker 40 A	1	-
iC60N	Miniature circuit breaker 10 A	6	-
iID  type	Residual current device, selective type	1	-
iDPN Vigi A-SI type	Super-immunised residual current breaker	2	-

Note: number of poles of MCB should be the same as SPD.

NG125



iPRF1 12.5r



iPRD8/iPRD40/  
iPRD40r




iC60



iDPN Vigi  
A-SI type



iID  type



iPRC  
series



iPRI



Communication networks  
protection

### More information:

For information concerning the protection of your electrical installation against lightning, please check our website or contact your local Schneider Electric office.

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